

with Dr. Boisduval's description. The spots of secondaries are pale yellow, very large, making a confluent band. I should place *Oregonia* between this species and the *Comma* group.

I tabulate these species as follows: 1. RURICOLA; 2. OREGONIA; 3. COLUMBIA; 4. COLORADO; 5. COLORADO var. IDAHO; 6. NEVADA; 7. MANITOBA; 8. JUBA; 9. JUBA var. VIRIDIS.

There is a recent description of what is called *PAMPHILA CALIFORNICA* n. sp. Mabille, Ann. de la Soc. Ent. de Belg. v. 27, p. 68, taken from one male only, and which lacks definiteness. I can find nothing to which it applies. Of the under side, it reads: "the secondaries are ochraceous, and one or two points of a pale yellow color can with difficulty be distinguished among the nervules." So that it cannot be one of this group we have been considering.

NOTES ON THIRIPIDÆ, WITH DESCRIPTIONS OF NEW SPECIES.*

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The family Thripidæ, though possessing many characters of peculiar interest, and being of no little importance economically, has received but very little attention from American Entomologists, either systematic or economic. With the exception of a few notes upon their habits, and descriptions of some four or five species by Dr. Fitch, and also a few notes by Mr. Walsh and Prof. Riley, concerning their food habits, scarcely anything has been written of our native species.

Without going into a discussion of the classification of the group, or the peculiar characters which seem to ally it to different orders, it will be sufficient here to state that the wings are entirely membranous and folded flat upon the back, which, with the general conformation of the body, would seem to place it with the *Homopterous* division of the *Hemiptera*. The mouth parts, however, are free, composed of both mandibles and maxillæ, and the maxillæ and labium are palpigerous—characters very

* Read before the Iowa Academy of Sciences, Sept. 5, 1882. Since this paper was read, Mr. Theo. Pergande, of Washington, has kindly examined my specimens and corrected some errors which had crept in, on account of my scanty literature on the subject and lack of types.

diverse from those of the group just mentioned. These differences have led some authors to separate the group into a distinct order, the *Thysanoptera*, while others have considered them an aberrant family of *Hemiptera*, others of *Orthoptera*, and still others of *Pseudo-Neuroptera*.

The most obvious characters are the minute size, the species nearly all ranging between one and two millimetres in length, and being very slender; the long narrow wings with broad fringes, folded flat on the back; the 2-jointed tarsi without ungues and terminating in a vesicle, and the beak-like mouth parts pointing backward, but composed of free mandibles and maxillæ, the mandibles being styliform.

The European species have been carefully worked by Mr. Haliday, to whom we are also indebted for the only systematic arrangement of the genera. His synopsis enumerates over forty species, and doubtless our American species are quite as numerous, for without there having been any apparent effort to collect them, a fair beginning has been made upon this number.

Dr. Fitch described four species in his reports on N. Y. Insects, and I understand that his notes contain MS. descriptions of two other species. The former are *Phlæothrips mali*, *P. caryæ*, *Thrips tritici* and *Colcothrips trifasciata*. Prof. Riley mentions a species (6th Rept. Mo. Insects, p. 50) as *Thrips phylloxera* of his MSS. Dr. Packard has described a species infesting onions (New and Inj. Ins. Little Known, 1870), and Prof. Comstock *Limothrips poaphagus* infesting heads of grass. Other descriptions may have been published of which I am not at present aware, and I have collected three species in this State which seem to be undescribed, beside two species which are known.

The *Thripide* frequent the blossoms of various plants, but their presence has been variously interpreted by different authors. In Westwood's "Classification" they are spoken of as feeding upon the plant tissues, and numerous instances are cited of their injuries to vegetation.

Dr. Fitch found his *Phlæothrips mali* gouging into young apples, and his *P. caryæ* in galls on hickory leaves, but doubted their agency in forming the galls. On wheat he states that *T. tritici* injures both blossoms and the growing kernels of wheat. Mr. Walsh held the opinion that Thrips are carnivorous and very beneficial in their attacks upon plant lice and other insects, and argues that they are found in blossoms and on other parts of plants simply in search of their prey. Prof. Riley describes the habits of his *Thrips phylloxera* as attacking the Grape Phylloxera.

If these observers have been correct in interpreting what they saw, we must admit that different species of the group possess different food habits, a point which should be admitted only on the strictest testimony, for while instances do occur where certain species in a distinct group differ in habits from the others, it is of rare occurrence—a fact more fully appreciated when we consider the intimate relations between structure, whereby groups are defined, and habit, these having naturally a mutual correspondence, whether we consider the habit necessitated by the structure or the structure a result of progenitary habit.

So far as the anatomy is concerned, it seems to me much in favor of a vegetable diet. Carnivorous insects as a rule are furnished with strong mouth parts, and are able to thrust them forward from the head, even if their normal position is otherwise. In *Thripidae* the mandibles are slender, styliform, and apparently weak and poorly adapted to the capture of prey, and the mouth parts pass backward under the prothorax. Owing to the minuteness of the insects positive observations upon their methods of feeding are difficult. I have watched them with a lens, and noticed that they thrust the mouth parts down upon the surface of a petal or other portion of the blossom, much as a fly does in sucking up sweets, but have never been able to see them actually puncture the tissue. I have noticed them in apple blossoms, however, where the petals were unopened and no other insects were present, and in these blossoms 80 per cent. were injured by punctures upon the styles and other parts, but particularly the styles, and all the evidence pointed to the Thrips as the cause of injury. Should the observations of other entomologists prove this to be a general habit, it has great economic importance, and shows that insects may have a far different influence than *assisting* in fertilization of plants, which we have come to consider as one of their benefactions, for whereas much has been written concerning the fertilization of plants by insects, comparatively little has been written upon the prevention of fertilization which they may cause.

Although I have observed Thrips in many situations beside the blossoms of apple, cherry and plum, as well as in blossoms of catalpa, asparagus, clover, potato, timothy grass, and a number of ornamental plants, I have never found evidence of their attacking insects. At one time I found a single individual near a colony of *Aphis maidis*, but nothing to indicate that it was attacking the lice.

The observations of Walsh and Riley must certainly be considered

conclusive for the species they noticed, but I cannot think they will hold for the group, but rather that they are departures from a normal habit, the Thrips in those cases finding the soft-bodied, sluggish plant lice preferable to the plant tissues lying beneath them,—the habits of the plant lice making it less necessary for the predaceous insect to be specially adapted to seizing and retaining them. Indeed, may it not be that they seek rather the juicy exudation from the bodies of these insects than to destroy them?

PHLÆOTHRIPS NIGRA, n. sp.

Length 1.75–1.80 m.m. Width .37 m.m.

Black, distal portion of anterior tibiæ, proximal joint of all tarsi and joints 3 with base of 4, sometimes 3–5, of antennæ, yellowish. Head from above quadrangular, longer than broad, front convex with lateral angles obtusely rounded. Antennæ sub-approximate, third joint yellowish and the two following ones more or less pale, especially at base; joints nearly equal, 8th short and small, sparsely set with hairs. Prothorax short, broad, lateral borders converging toward the head; meso and meta-thorax together as long as broad, converging slightly toward the abdomen; abdomen tapering, caudal segments sparsely fringed with hairs; tube fringed at end. Anterior legs larger than the others, with tibiæ and tarsi yellowish, set with a few very minute hairs; posterior tibiæ with spines at the distal extremity.

Wings without veins, perfectly membranous, no minute hairs on the surfaces; anterior pair with a row of three spines near the costal border at the base; fringe at base wanting; very long on both borders and at apical portion of posterior border composed of two rows, the additional one of finer ciliæ.

Differs but slightly from *P. mali* Fitch, that species being purple-black, joint three of antennæ white and the tibiæ and tarsi not yellow. Possibly this may prove only a variable form. Collected from heads of red clover. Ames, Iowa.

CHIROTHRIPS ANTENNATUS, n. sp.

Length 1.10 m.m. Width .25 m.m.

Black, except joint 3 of antennæ, which is paler.

Head small, narrowed in front, and here entirely occupied by the bases of the large peculiar 8-jointed antennæ, the basal joints of which are very broad, short and inserted in large concavities of the front; joint 2 is large, irregularly trapezoidal, with the acute angle outward; joints 3

and 4 irregular, ovate, with an elongated papilla extending from the outer anterior portion; joints 5 and 6 slightly smaller, 7 and 8 minute; in some cases traces of a ninth joint can be seen; joints 5-8 are more hairy than the others; 3-6 dilated; ocelli placed far back on the vertex; prothorax converging rapidly to the anterior border, where it is equal in width to the occiput, broader at posterior border than long; a few spines at posterior angles. In front of mesothorax, forming a girdle, is a narrow thickened portion, which at the sides, with an amplification of 150 diameters, is seen to be thickly set with very short pointed spurs; mesothorax short and broad; metathorax slightly narrower; legs nearly equal, anterior ones a little more robust and with few scattered hairs, intermediate and posterior ones more hairy and with tibiae on distal portion, and the tarsi, spiny. Wings slender, sword-shaped, anterior pair smoky, with two longitudinal veins, costal fringe not more than half as long as inner, beginning near the base with strong spines, a few spines situated on the veins; posterior wings hyaline, a thickened line (vein?) along the middle. Both wings with minute short hairs scattered over the membrane; abdomen tapers suddenly after seventh segment, a few hairs on anterior segments, becoming longer and more numerous caudad.

Collected at Manchester, Delaware Co., Iowa, where it was very abundant in heads of timothy grass. July 10th, 12th, 1882.

THRIPS STRIATA, n. sp.

Female. Length 1.15 m.m. Width .25 m.m. Whitish with yellow and blackish markings.

Head rounded in front, appears marked with transverse striae and dusky border posteriorly; antennae approximate, whitish at base, gradually becoming more dusky toward the apex, where they are nearly black. Eyes large; ocelli near together and well up on vertex. Thorax with elongated dusky patches forming a broken subdorsal stripe each side; on the prothorax these extend latero-cephalad and are broken into spots; abdominal segments 1-6 are dusky on tergum, except at the sides, seventh has dusky spot in centre, apex slightly dusky and surrounded with black spines; thorax and abdomen tinged with yellow at the sides. Hairs scarce and fine, except at end of abdomen. Legs concolorous with body, with dusky patches on dorsal aspect of femora and tibiae, sparsely set with fine hairs. Wings unmarked, fringe and spines wanting at base of costal border, no discal spines; both wings covered with very minute hairs.

I do not know what is the food plant of this species, the only specimen I have being caught on the leaf of a book I was reading in the Zoological Laboratory (fourth floor of building). It probably flew in at an open window. Taken Aug. 11, 1882.

THRIPS TRITICI Fitch. Trans. N. Y. Ag. Soc. for 1855, page 540.

Male, length .75-.80 m.m.; width .20 m.m. Female, length 1.10-1.20 m.m.; width .25 m.m.

Color yellow, thorax tinted with orange; antennæ with dusky annulations.

Head from above nearly square, eyes occupying anterior angles. Antennæ approximate at base, joint 2, apical half of 4, and 6, dusky; joints 3 and 5 dusky at apex, the antennæ appearing annulated under low power of microscope. Head, thorax and abdomen with few stiff hairs. Legs concolorous with body, all the tibiæ with two spines at distal end, distal joint of tarsi a little dusky, proximal joint of hind tarsi with two spines. Wings narrow, hyaline, fringes whitish; anterior wings have costal fringe of shorter ciliæ than posterior ones, and the ciliæ are intermixed with shorter, stiffer, spiny hairs, which at base replace the fringe; two rows of blackish spines on upper surface of wing corresponding to subcostal and median veins. Posterior wings with no discal spines; ciliæ of anterior edge shorter and more spiny than those of posterior. Both wings have numerous rows of very minute hairs on the surface. The males are shorter and smaller than females, with wings reaching beyond the tip of the abdomen instead of nearly to it, and there are some strong spines near the tip of the abdomen.

This species is the one most abundant in this locality, and the one upon which most of my observations have been made. Dr. Fitch speaks of the antennæ as widely separated at base, and his figure (a very poor one) makes them particularly so, which led me to think I had a distinct species; but Mr. Pergande has kindly compared my specimens with the type and pronounces them identical.